



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/026,278	12/18/2001	Eko N. Onggosanusi	TI-32854	8075
23494	7590	06/15/2005	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			WONG, LINDA	
			ART UNIT	PAPER NUMBER
			2634	

DATE MAILED: 06/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/026,278

Applicant(s)

ONGGOSANUSI ET AL.

Examiner

Linda Wong

Art Unit

2634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 December 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-74 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 10, 13-15, 19, 21-35, 37-39, 42-44, 47-49, 53-71, 73-74 is/are rejected.
- 7) ☒ Claim(s) 2-9, 11, 12, 16-18, 20, 32, 33, 36-38, 40, 41, 45, 46, 50-52 and 72 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 December 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. **Claim 59** is rejected under 35 U.S.C. 112, second paragraph, as being unclear and does not limit the antecedent claim 57. Claim 59 recites "the plurality of transmit antennas are less in number than the plurality of receive antennas". Claim 57 recites "the plurality of transmit antennas and the plurality of receive antennas are a same number of antennas." A lesser number of antennas does not limit an equal number of antennas. It is suggested by the examiner that the dependency of claim 59 is changed to depend on claim 42.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. **Claim 68** is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. Claim 68 recites the limitation of "modulating the plurality of signals". Based on the specification, figures and basic communication techniques, when signals are received, the signals are demodulated, not modulated as recited. It is suggested by the examiner that the term "modulating" is changed to "demodulating".

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. **Claim 1** is rejected under 35 U.S.C. 103(a) as being unpatentable over the prior art admitted by the applicant (pages 1-5), in view of Dettman (Introduction to Linear Algebra and Differential Equations) and further in view of Mueller et al. (US Patent No.: 5323322).

a. **Claim 1**, the admitted prior art discloses a receiver and a transmitter, wherein the transmitted signals comprise of respective streams of independent symbols and inherently discloses interference occurs between the respective streams (page 1, paragraph [0007], lines 14-30), a plurality of receiver antennas, whereing the signals received are affected by channel effect (page 1, paragraph [0007], lines 25-27), a multiplying the conjugate transpose of the channel estimate with the conjugate of the linear basis transformation matrix or a eigenvector matrix. According to Dettman, eigenvectors falls into the category of a linear transformation matrix. (page 166, Definition 4.5.1) Although the admitted prior art does not disclose a selecting circuitry for selecting a linear basis matrix and a removing circuitry for removing interference, Mueller et al discloses choosing a linear transformation matrix, specifically a Housholder transformation matrix, and using the transformation to remove the interference

or reference receiver clock errors. (Col. 18, lines 35-45) Although Mueller et al does not explicitly disclose selecting from a finite set of matrices, the Housholder matrix selected is a combined set of vector and matrix, which would indicate that the selection is selected from a finite set. (Col. 20, $\{D_{OR}\}_k$ definition) It would be obvious to one skilled in the art to combine the admitted prior art and Mueller et al's inventions to eliminate interference to improve quality of the signal.

4. **Claim 10** is rejected under 35 U.S.C. 103(a) as being unpatentable over the prior art admitted by the applicant (pages 1-5), in view of Dettman (Introduction to Linear Algebra and Differential Equations), further in view of Mueller et al. (US Patent No.: 5323322) and further in view of Jöngren et al. (US Publication No.: 20010033622).
 - a. **Claim 10**, Although the admitted prior art, Dettman, and Mueller et al. do not disclose a feedback communicating the identification of the linear basis transformation matrix to the transmitter from the receiver, Jöngren et al. disclose a feedback communicating the coefficients of the channel estimate. Based on the recitation of claim 1, the linear transformation matrix is multiplied by the channel estimate complex conjugate matrix, thus the linear transformation matrix identification communicated to the transmitter would be information about the channel estimate or as disclosed by Jöngren, the channel estimate coefficients. (page 3, paragraph [0028], lines 1-4 and paragraph [0029], lines 1-3) It would be obvious to one skilled in the art to incorporate the

admitted prior art, Mueller et al and Jöngren et al's inventions to establish a closed loop system so that the transmitter can adjust the parameters to incorporate the information fed from the receiver.

5. **Claim 13-15** are rejected under 35 U.S.C. 103(a) as being unpatentable over the prior art admitted by the applicant (pages 1-5), in view of Dettman (Introduction to Linear Algebra and Differential Equations) and further in view of Mueller et al. (US Patent No.: 5323322).
 - a. **Claims 13 and 14**, rotations and phase changes are inherent when performing transformations of a matrix. (Dettman, pages 140 and 141, Definitions 4.2.1 and 4.2.2 and example 4.2.3)
 - b. **Claim 15**, Dettman discloses the matrix recited in the claim as a standard representation of a linear transformation matrix. (page 167, example 4.5.3)
6. **Claim 19** are rejected under 35 U.S.C. 103(a) as being unpatentable over the prior art admitted by the applicant (pages 1-5), in view of Dettman (Introduction to Linear Algebra and Differential Equations) and further in view of Mueller et al. (US Patent No.: 5323322) and further in view of Bevan et al. (US Patent No.: 6897897)
 - a. **Claim 19**, Although the admitted prior art, Dettman and Mueller et al. do not teach a space time block coded decoding circuitry, Bevan et al discloses a space time coding multi-input multi-output system using space time decoders. (Fig. 5, label Decoder) It would be obvious to one skilled in the art to

Art Unit: 2634

incorporate the admitted prior art, Mueller et al and Bevan et al's inventions to improve power efficiency and bandwidth efficiency. (Col. 1, lines 32-40)

7. **Claims 21-24** are rejected under 35 U.S.C. 103(a) as being unpatentable over the prior art admitted by the applicant (pages 1-5), in view of Dettman (Introduction to Linear Algebra and Differential Equations) and further in view of Mueller et al. (US Patent No.: 5323322).
- a. **Claim 21**, the admitted prior art discloses signals with pilot symbols and inherently, discloses channel effects are calculated using the pilot symbols. (page 2, paragraph [0009], lines 13-18 and paragraph [0010], lines 13-15)
 - b. **Claim 22**, the admitted prior art discloses in a CDMA system, interference is removed according to various techniques, such as zero forcing, minimum mean square error, linear or iterative operations and maximum likelihood. (page 2, paragraph [0012], lines 10-15)
 - c. **Claim 23**, the admitted prior art discloses a CDMA technique, which indicates that the despreader found in the system is using CDMA. (Fig. 2, label 32 and page 2, paragraph [0012], lines 10-15)
 - d. **Claim 24**, Although the admitted prior art, Dettman, and Mueller et al do not disclose TDMA signals, Bevan et al discloses a CDMA/TDMA system. (Col. 2, lines 45-50)

Art Unit: 2634

8. **Claims 25, 26** are rejected under 35 U.S.C. 103(a) as being unpatentable over the prior art admitted by the applicant (pages 1-5), in view of Dettman (Introduction to Linear Algebra and Differential Equations) and further in view of Mueller et al. (US Patent No.: 5323322) and further in view of Bevan et al. (US Patent No.: 6897897)
 - a. **Claim 25**, Although the admitted prior art, Mueller et al and Dettman do not disclose QAM, QPSK, BPSK, Bevan et al discloses space time symbols made up of QPSK, or 8-PSK (BPSK) or QAM. (Fig. 1, label L'Space-Time Symbols)
 - b. **Claim 26** inherits the limitations of claim 19.

9. **Claims 27-31,34-35,39** are rejected under 35 U.S.C. 103(a) as being unpatentable over the prior art admitted by the applicant (pages 1-5), in view of Dettman (Introduction to Linear Algebra and Differential Equations) and further in view of Mueller et al. (US Patent No.: 5323322).
 - a. **Claims 27, 28 and 29**, the admitted prior art discloses a plurality of receiver and transmitter antennas, wherein the number of transmitting antennas is less than the number of receiving antennas. Although the admitted prior art does not explicitly state that the number of antennas, either receiving or transmitter, is 2, the prior art discloses a plurality of both, which indicates that the number must be greater than or equal to 2. (page 1, paragraph [0007], lines 24-26)
 - b. **Claim 30**, the admitted prior art discloses a demodulator, a deinterleaver and a decoder. (Fig. 2, labels 36, 38, and 40)

Art Unit: 2634

- c. **Claim 31** inherits all the limitations of claim 1, but does not disclose a plurality of receiving and transmitting antennas. The admitted prior art discloses a wireless communication system comprising a plurality of transmitters and receivers, and inherently discloses interference occurs between the respective streams.
- d. **Claim 34** inherits all the limitations of claim 13.
- e. **Claim 35** inherits all the limitations of claim 14.
- f. **Claim 39** inherits all the limitations of claim 1.

10. **Claims 42-44,47-49,54** are rejected under 35 U.S.C. 103(a) as being unpatentable over the prior art admitted by the applicant (pages 1-5), in view of Dettman (Introduction to Linear Algebra and Differential Equations), further in view of Mueller et al. (US Patent No.: 5323322) and further in view of Jöngren et al. (US Publication No.: 20010033622).

- a. **Claim 42** inherits all the limitations of claims 1 and 10.
- b. **Claim 43** inherits all the limitations of claims 1 and 10.
- c. **Claim 44** inherits all the limitations of claim 1.
- d. **Claim 47** inherits all the limitations of claim 13.
- e. **Claim 48** inherits all the limitations of claim 14.
- f. **Claim 49** inherits all the limitations of claim 15.
- g. **Claim 54** inherits all the limitations of claim 23.

Art Unit: 2634

11. **Claims 53,55-56** are rejected under 35 U.S.C. 103(a) as being unpatentable over the prior art admitted by the applicant (pages 1-5), in view of Dettman (Introduction to Linear Algebra and Differential Equations) and further in view of Mueller et al. (US Patent No.: 5323322) and further in view of Bevan et al (US Patent No.: 6891897).
 - a. **Claim 53** inherits all the limitations of claim 26.
 - b. **Claim 55** inherits all the limitations of claim 24.
 - c. **Claim 56** inherits all the limitations of claim 25.

12. **Claims 57-62** are rejected under 35 U.S.C. 103(a) as being unpatentable over the prior art admitted by the applicant (pages 1-5), in view of Dettman (Introduction to Linear Algebra and Differential Equations) and further in view of Mueller et al. (US Patent No.: 5323322).
 - a. **Claim 57** inherits all the limitations of claim 27.
 - b. **Claim 58** inherits all the limitations of claim 28.
 - c. **Claim 59** inherits all the limitations of claim 29.
 - d. **Claim 60** inherits all the limitations of claim 1.
 - e. **Claim 61**, the admitted prior art discloses dispreading CDMA signals with a CDMA code.
 - f. **Claim 62** inherits all the limitations of claim 1.

Art Unit: 2634

13. **Claim 63** is rejected under 35 U.S.C. 103(a) as being unpatentable over the prior art admitted by the applicant (pages 1-5), in view of Dettman (Introduction to Linear Algebra and Differential Equations), further in view of Mueller et al. (US Patent No.: 5323322) and further in view of Jöngren et al. (US Publication No.: 20010033622).
- a. **Claim 63** inherits all the limitations of claims 1 and 10.
14. **Claim 64-74** are rejected under 35 U.S.C. 103(a) as being unpatentable over the prior art admitted by the applicant (pages 1-5), in view of Dettman (Introduction to Linear Algebra and Differential Equations), further in view of Mueller et al. (US Patent No.: 5323322).
- a. **Claim 64**, the admitted prior art discloses converting parallel signals to serial signals, a demodulator, a deinterleaver and a decoder. (Fig. 2, labels 34, 36, 38 and 40)
- b. **Claim 65**, the admitted prior art discloses converting symbols using pilot symbols, which indicates a plurality of pilot symbols. (page 2, paragraph [0009], lines 13-18)
- c. **Claim 66** inherits all the limitations of claim 1.
- d. **Claim 67**, the admitted prior art discloses encoding a plurality of signals using unique codes. (page 2, paragraph [0009], lines 39-42)
- e. **Claim 68**, assuming the applicant will change claim 68 as suggested by the examiner, the following claim is rejected by the disclosure of the admitted prior art. The admitted prior art discloses receiving a plurality of signals,

demodulating the plurality of signals, multiplying the plurality of signals by a matrix, and transmitting the plurality of signals from a plurality of transmit antennas. (Fig.2, labels RAT3, RAT4, 36 and TAT3, TAT4 and page 2, paragraphs [0016], [0017], [0018] and [0019])

- f. **Claim 69** inherits all the limitations of claim 61.
- g. **Claim 70** inherits all the limitations of claim 1.
- h. **Claim 71**, the admitted prior art discloses encoding the plurality of signals, an interleaver, and a serial/parallel converter. (Fig. 2, labels 16, 18, 20)
- i. **Claim 73** inherits all the limitations of claim 66.
- j. **Claim 74** inherits all the limitations of claim 67.

Allowable Subject Matter

15. **Claims 2-9,11,12,16-18,20,32,33,36-38,40-41,45-46,50,51-52,72** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Linda Wong whose telephone number is 571-272-6044. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on (571) 272-3056. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2634

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

LW



STEPHEN CHIN
SUPERVISORY PATENT EXAMINE
TECHNOLOGY CENTER 2800